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NCHSR National Health Care Expenditures Study

Dental Services: Use, Expenditures, and Sources of Payment

Data Preview 8

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Background

Background of the Study

Examining how Americans use health care services and determining national patterns of health expenditures and insurance coverage are the goals of a landmark study by the National Center for Health Services Research (NCHSR). A major component of NCHSR's Intramural Research Program, the National Health Care Expenditures Study (NHCES) will provide information on a number of critical issues of national health policy. Topics of particular interest to government agencies, legislative bodies, health professionals, and others concerned with health care policies and expenditures include:

- The cost, utilization, and budgetary implications of changes in federal financing programs for health care and of alternatives to the present structure of private health insurance.
- The breadth and depth of health insurance coverage.
- The proportion of health care costs paid by various insurance mechanisms.
- The influence of Medicare and Medicaid programs on the use and costs of medical care.
- How and why Medicaid participation changes over time.
- The cost and effectiveness of different federal, state, and local programs aimed at improving access to care.
- The loss of revenue resulting from current tax treatment of medical and health insurance expenses, particularly with regard to the benefits currently accruing to different categories of individuals and employers, and the potential effects on the federal budget of proposed changes to tax laws.
- How costs of care vary according to diagnostic categories and treatment settings.

The data for these studies were obtained in the National Medical Care Expenditure Survey (NMCES), which has provided the most comprehensive statistical picture to date of how health services are used and paid for in the United States. The survey was completed in September, 1979.

Data were obtained in three separate, complementary stages. About 14,000 randomly selected households in the civilian, noninstitutionalized population were interviewed six times over an 18-month period during 1977 and 1978. This survey was complemented by additional surveys of physicians and health care facilities providing care to household members during 1977 and of employers and insurance companies responsible for their insurance coverage.

Funding for NMCES was provided by NCHSR, which cosponsored the survey with the National Center for Health Statistics. Data collection for the survey was done by Research Triangle Institute, NC, and its subcontractors, National Opinion Research Center of the University of Chicago, and Abt Associates, Inc., of Cambridge, MA, under contract HRA 230-76-0268. Data processing support was provided by Social and Scientific Systems, Inc., of Washington, DC, under contracts 233-79-3022 and 233-80-3012.

This report is one of a Data Preview Series that will present estimates of several key measures of health insurance, health services use, and health care expenditures.

October 1982

NHCES reports are available from NCHSR, Publications and Information Branch, Room 7-44, 3700 East-West Highway, Hyattsville, MD 20782, 301/436-8970. The graphics and editorial coordinator for this publication series is Maria Friedman.

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Dental Services: Use, Expenditures, and Sources of Payment

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Expenses for personal dental services in the United States were almost $12 billion in 1977. Nearly 73 percent of these expenses were paid by the patient's family out of pocket, indicating that dental services are one of the most expensive types of personal health care in terms of the share paid by family.

This data preview from the National Health Care Expenditures Study presents population estimates for the use of and expenses for dental services. Differences among selected population groups are shown by the percent of the population with or without a dental visit and by the frequency of dental visits. Mean charges per visit and the average proportion paid per visit according to sources of payment are established, and the distribution of the population by out-of-pocket expenses for dental care is shown. Finally, annual expenditures per person with expenses for dental care are presented. All findings are from final household data reported for the period January 1 to December 31, 1977, in the National Medical Care Expenditure Survey (see pages 9 and 10 for the sources and limitations of these data).

Use of dental services

Approximately 41 percent of the population had at least one dental visit in 1977 (Table 1), for a mean visit rate of 1.3 per person. Among persons with at least one visit, the mean number of visits was 3.2 per person.

Differences in visit rates by age were pronounced. Half of those 6 to 18 years of age visited the dentist at least once in 1977, compared to 13.8 percent of those less than 6 years of age and 29.9 percent of those 65 years or older. The mean visit rate per person with a visit in the latter age group was comparable, however, to the total rate of 3.2 visits.

Females had both more visits per person and were more likely to have a visit than males, although these differences were not large (38.6 percent of males and 43.3 percent of females had at least one dental visit).

Differences in the likelihood of use of dental services by ethnic/racial background were pronounced. Roughly 23 percent of blacks and 30 percent of Hispanics had at least one dental visit in 1977, compared to 47 percent of whites. However, those whites and Hispanics with any visits had approximately the same level of use (roughly 3 visits per person), while blacks averaged 2.5 visits.

Both family income and the education of the family head were directly related to the use of dental services. Being in the highest income group (with a family income of $20,000 annually or more) increased the likelihood of having a visit by approximately 20 percent over that for persons in the lowest income group (less than $12,000). Similarly, only one-fourth of those in families where the household head had less than 9 years of schooling used any dental services, compared to nearly two-thirds of those in the highest educational group (16 or more years of education).

The likelihood of use was similar for the employed and the unemployed population. However, the percentage of the employed

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with at least one visit was somewhat higher than for those not in the labor force. Mean rates of use were not affected by employment status.

Differences in use according to place of residence and U.S. Census region were small with the exception of the South, where the population was less likely than in other regions of the country to have had a dental visit.

Charges and sources of payment

For the more than one-quarter billion visits with a charge (98 percent of all dental visits), the average or mean charge in 1977 was $44 (Table 2). Among various sources of payment, the family ranked well ahead, paying approximately three-fourths of the charge per visit, while private health insurance, the next largest source of payment, paid an average proportion of 0.15 of the charge. Medicaid and other sources paid approximately equal shares of the remaining 0.09 of the average charge per visit.

While charges were similar, payment sources differed by age. The proportion paid by the family generally increased with patient age. It was lowest for children less than 6 years (0.63) and highest for those 65 years or older (0.90). The proportion paid by private health insurance was highest for those 25 to 54 years of age (0.20) and lowest for persons 65 years or older (0.03). The availability of dental benefits for children under many state Medicaid programs is reflected in the relatively high proportion paid by this source for children under 6 years of age (0.12).

No differences in average charges were observed for males and females, nor for groups categorized by the patient's ethnic/racial background, family income, or educational level. However, the proportion paid by the family was higher for whites (0.78) than for blacks (0.58) or Hispanics (0.62), while the share paid by private health insurance was similar for whites and blacks (0.16 and 0.18, respectively). Medicaid paid nearly one-fifth of the average charge for both blacks and Hispanics, compared to 0.02 for whites.

The share paid by the family was similar among income categories, while that paid by private health insurance rose with family income (from 0.10 to 0.19 of the charge for those with family incomes of less than $12,000 and above $20,000, respectively). Medicaid paid a relatively large share for the lowest income group (0.12 of the average charge per visit).

By contrast, the share paid by the family was 0.67 for those with 9 to 11 years of schooling and 0.81 for those in families headed by persons with 16 years or more of education. Private health insurance paid the smallest share for those in the lowest educational category, while Medicaid paid roughly 0.10 of the charge for those in the two lowest educational groups.

Neither charges nor sources of payment for dental visits differed appreciably by employment status and, except for the share paid by the family, by place of residence. Differences by region of the country were more pronounced. The mean charge per visit was highest in the West ($51), followed by $47 in the Northeast and roughly $40 in both the North Central region and the South. Also, the average proportion paid

by the family was lowest in the West (0.67), and that paid by private health insurance and Medicaid was lowest in the South (0.08 and 0.02).

Annual out-of-pocket expenses

More than 13 million persons (6.2 percent of the population) had at least one dental visit and no out-of-pocket expense in 1977 (Table 3). For approximately one-fifth of the population, or about 42 million people, out-of-pocket expenses ranged from $1 to $49. Out-of-pocket expenses of $1,000 or more were incurred by nearly 1.2 million persons (0.6 percent of the population).

Among age categories, the group with the highest rate of use of dental services (those 6 to 18 years of age) was most likely either to have used services without any out-of-pocket expense or to have incurred expenses of $1,000 or more. Persons 65 years or older were least likely to have had no annual out-of-pocket expense for dental services.

A somewhat larger percentage of blacks (8.1 percent) and Hispanics (9.8 percent) than whites (5.8 percent) used dental services in 1977 without any out-of-pocket expense by the family. Nearly a quarter of all whites (roughly 50 percent of those with visits) had relatively low ($1 to $49) out-of-pocket expenses, compared to roughly 10 percent of all blacks and Hispanics. Only 1.7 percent of blacks had out-of-pocket expenses exceeding $200, compared to 5.4 percent of whites and 4.0 percent of Hispanics.

The percentage of persons with moderately high annual out-of-pocket expenses ($200 to $999) increased with family income and education of the family head: from 2.9 percent of those with family incomes of less than $12,000 in 1977 to nearly 6 percent of persons with family incomes of $20,000 or more. Fewer than 3 percent in families at the two lowest educational levels had out-of-pocket expenses at this level, compared to 7.5 percent of those with 16 or more years of education. These differences by educational level were also seen among those with $1,000 or more in annual dental expenses.

Differences by employment status, however, were not large. A somewhat smaller percentage of persons not in the labor force had no or small ($1 to $49) out-of-pocket expenses than did the employed or the unemployed. The unemployed were more likely to have at least one visit without out-of-pocket expenses (7.4 percent) compared to employed persons (5.6 percent).

The distribution of out-of-pocket expenses by place of residence and U.S. Census region indicated that the lowest percentage of persons with no out-of-pocket expense for a dental visit lived in the South. A relatively high number of persons in the Northeast (6.4 percent) and in the West (5.6 percent) incurred out-of-pocket expenses in excess of $200.

Annual expenditures

Almost $12 billion were spent in 1977 for the almost 85 million persons with charges for dental services, or a mean expense per person of $139 (Table 4). Of this total, the family paid nearly three-fourths (72.4 percent). Private health insurance paid almost 18 percent, Medicaid 2.4 percent, and other sources 7.3 percent.

Average annual expenses for dental services were lowest for children less than 6 years of age and roughly 40 percent of the average for all persons with such expenses. Expenses for the second lowest use group, those over 65 years (see Table 1), were close to this population total. The family paid 60.2 percent of the annual dental expenses for children under 6, the lowest share for all age groups. By contrast, nearly 90 percent of annual dental expenses incurred by the elderly (65 years or older) were paid by the family, and only 3.8 percent were paid by private health insurance.

Females using dental services had similar annual expenses ($142) as males ($136), and there was no difference in the distribution of these expenses among sources of payment.

By contrast, both mean annual expenses and payment sources differed among persons with different ethnic/racial backgrounds. Expenses were higher for Hispanics than for blacks, $146 and $114, respectively; they were $127 for whites. Nearly three-fourths of annual expenses for services used by whites and two-thirds of those used by Hispanics were paid by the family, compared to about one-half of expenses for blacks. Private health insurance assumed a relatively large share of expenses for the black group, 29.3 percent, compared to 16.1 percent for the Hispanic group and 18.2 percent for the white group. Medicaid assumed roughly 10 percent for blacks and Hispanics and 1.6 percent for whites.

Differences in annual expenses for services by income existed but were not pronounced; those with family incomes between $12,000 and $19,999 had somewhat lower annual expenses than the highest income group. Private insurance payments were lower than the population total for those with the lowest family income. Similar trends were found for the educational status of the head of the family. Average annual expense tended to rise with education: persons in families headed by those with less than 9 years of education had expenses of $125 compared to $153 for those in families in the highest educational category. Payments by the family were relatively low for persons in families with heads having 9 to 11 years of education (64 percent compared to a national total of 72.4 percent), while the share borne by private health insurance was comparatively high in this group (21.4 percent).

Annual expenses were similar for the employed and the unemployed, as were sources of payment. Medicaid was the exception; it assumed approximately 3.5 percent of expenses for the unemployed.

Annual expenses for those using services were lower and the share paid by the family was higher for persons in more rural areas than for those in SMSAs. Also, annual expenses were lower both in the North Central region ($119) and in the South ($114) than in the Northeast ($167) and the West ($172). Payments by the family were highest in the South (81.4 percent) and lowest in the West (65.3 percent). The relative share of annual expenses paid by private health insurance in the South was almost one-half that paid in the other regions of the country. Medicaid also paid less in the South than in the other regions (South, $47 million; West, $84 million; North Central, $79 million; and Northeast, $77 million).

Table 1
Use of dental services: Persons with and without dental visits and mean number of dental visits per person and per person with at least one visit, by selected population characteristics
NMCES household data: United States, 1977

Population characteristics	Total population (in thousands)	Persons without dental visit	Persons with at least one dental visit	Dental visits per person	Dental visits per person with visit
		Percent		Mean	
Total[a,b,c,d]	212,098	59.0	41.1	1.3	3.2
Age in years					
Less than 6	18,216	86.2	13.8	0.3	2.2
6 to 18	50,647	49.1	50.9	1.8	3.6
19 to 24	22,299	59.2	40.8	1.2	2.9
25 to 54	78,472	55.9	44.1	1.4	3.1
55 to 64	20,180	58.4	41.6	1.5	3.5
65 or older	22,284	70.1	29.9	1.0	3.3
Sex					
Male	102,602	61.4	38.6	1.2	3.1
Female	109,496	56.7	43.3	1.5	3.4
Ethnic/racial background					
White	147,239	53.0	47.0	1.5	3.1
Black	19,573	76.6	23.4	0.6	2.5
Hispanic	8,821	70.1	29.9	1.0	3.2
Family income					
Less than $12,000	74,816	69.2	30.8	1.0	3.3
$12,000 to $19,999	55,970	58.5	41.5	1.3	3.1
$20,000 or more	80,718	49.9	50.1	1.7	3.3
Education of family head					
Less than 9 years	41,295	74.2	25.8	0.8	3.1
9 to 11 years	33,679	65.6	34.4	1.1	3.2
12 years	67,505	57.2	42.8	1.4	3.2
13 to 15 years	27,906	50.1	49.9	1.7	3.4
16 or more years	32,345	39.6	60.4	2.0	3.4
Employment status					
Employed	89,077	55.0	45.0	1.4	3.1
Unemployed	5,865	56.1	43.9	1.4	3.2
Not in labor force	69,920	61.5	38.6	1.4	3.6
Place of residence					
SMSA	147,419	58.3	41.7	1.4	3.3
Other	64,679	60.5	39.5	1.2	3.0
U.S. Census region					
Northeast	47,137	56.4	43.6	1.6	3.6
North Central	58,039	54.6	45.4	1.4	3.1
South	67,357	65.2	34.8	1.0	2.9
West	39,565	57.7	42.3	1.4	3.4

[a]Includes all other ethnic/racial groups not shown separately. [b]Includes persons with negative income. [c]Includes persons with unknown education. [d]Includes all those not in the labor force but less than 16 years of age. Source: National Center for Health Services Research.

Table 2
Charges and sources of payment for dental services:
Mean charge per visit and proportion paid by different sources of payment
NMCES household data: United States, 1977

Population characteristics	Total visits with charge (in thousands)	Mean charge per visit	Source of payment			
			Family	Private health insurance	Medicaid	Other[a]
		$	Average proportion paid			
Total[b,c,d,e]	270,190	44	0.76	0.15	0.04	0.05
Age in years						
Less than 6	5,039	*30	0.63	0.16	0.12	0.09
6 to 18	88,695	41	0.75	0.15	0.06	0.05
19 to 24	25,025	46	0.75	0.12	0.05	0.08
25 to 54	101,789	46	0.73	0.20	0.02	0.05
55 to 64	28,522	44	0.79	0.15	0.02	0.04
65 years or older	21,120	*43	0.90	0.03	0.02	0.04
Sex						
Male	117,895	45	0.75	0.16	0.03	0.06
Female	152,295	43	0.76	0.15	0.04	0.04
Ethnic/racial background						
White	206,655	42	0.78	0.16	0.02	0.04
Black	11,209	45	0.58	0.18	0.18	0.07
Hispanic	8,129	*46	0.62	0.12	0.19	0.06
Family income						
Less than $12,000	71,488	43	0.71	0.10	0.12	0.08
$12,000 to $19,999	68,050	41	0.77	0.16	0.02	0.05
$20,000 or more	129,803	45	0.77	0.19	0.00	0.04
Education of family head						
Less than 9 years	31,781	41	0.74	0.10	0.11	0.05
9 to 11 years	35,306	42	0.67	0.17	0.09	0.07
12 years	88,116	42	0.75	0.17	0.03	0.05
13 to 15 years	44,855	47	0.78	0.16	0.01	0.05
16 or more years	62,702	46	0.81	0.14	0.00	0.04
Employment status						
Employed	119,569	47	0.76	0.18	0.01	0.05
Unemployed	7,819	*47	0.71	0.16	0.06	0.06
Not in labor force	93,808	45	0.78	0.12	0.05	0.05
Place of residence						
SMSA	197,713	45	0.74	0.17	0.04	0.05
Other	72,477	40	0.80	0.13	0.03	0.05
U.S. Census region						
Northeast	71,795	47	0.75	0.17	0.04	0.04
North Central	78,273	39	0.74	0.18	0.04	0.04
South	65,582	40	0.85	0.08	0.02	0.05
West	54,540	51	0.67	0.19	0.05	0.09

[a]Includes Medicare, CHAMPUS, CHAMPVA, the Indian Health Service, the Veterans Administration, the military, and other federal, state, city or county payers, philanthropic institutions, and unknown sources of payment. [b]Includes all other ethnic/racial groups not shown separately. [c]Includes persons with negative income. [d]Includes persons with unknown education. [e]Includes all those not in the labor force but less than 14 years of age. 0.00 indicates quantity greater than 0.00 but less than 0.05. *Relative standard error is equal to or greater than 30 percent. Source: National Center for Health Services Research.

Table 3

Out-of-pocket expenses for dental services: Percent distribution of persons with and without dental visits by intervals of out-of-pocket expense

NMCES household data: United States, 1977

Population characteristics	Total population (in thousands)	Out-of-pocket expense						No visit
		None	$1-$49	$50-$99	$100-$199	$200-$999	$1000 or more	
		Percent distribution						
Total[a,b,c,d]	212,098	6.2	19.8	6.3	3.8	4.3	0.6	59.0
Age in years								
Less than 6	18,216	4.2	7.5	1.0	0.8	0.3	–	86.2
6 to 18	50,647	9.9	24.2	6.5	3.8	5.4	1.0	49.1
19 to 24	22,299	6.6	19.3	7.1	3.8	3.4	0.6	59.2
25 to 54	78,472	5.9	21.7	7.2	4.5	4.4	0.4	55.9
55 to 64	20,180	3.7	19.8	7.1	4.7	5.8	0.5	58.4
65 or older	22,284	2.5	13.8	5.5	3.4	4.3	0.4	70.1
Sex								
Male	102,602	6.2	19.0	5.7	3.4	3.9	0.5	61.4
Female	109,496	6.2	20.6	7.0	4.2	4.7	0.6	56.7
Ethnic/racial background								
White	147,239	5.8	23.8	7.6	4.4	4.9	0.5	53.0
Black	19,573	8.1	9.5	2.6	1.7	1.5	0.2	76.6
Hispanic	8,821	9.8	10.8	3.2	2.2	3.6	0.4	70.1
Family income								
Less than $12,000	74,816	7.2	13.1	4.3	2.9	2.9	0.5	69.2
$12,000 to $19,999	55,970	5.7	21.7	6.2	3.7	3.7	0.5	58.5
$20,000 or more	80,718	5.6	24.7	8.3	4.9	6.0	0.7	49.9
Education of family head								
Less than 9 years	41,295	5.4	12.2	3.3	1.9	2.7	0.3	74.2
9 to 11 years	33,679	7.3	15.8	5.1	3.0	2.9	0.4	65.6
12 years	67,505	6.3	21.4	6.6	3.9	4.1	0.5	57.2
13 to 15 years	27,906	5.9	24.0	7.9	5.5	5.6	1.0	50.1
16 or more years	32,345	6.5	29.3	10.1	6.0	7.5	1.0	39.6
Employment status								
Employed	89,077	5.6	22.1	7.4	4.6	4.7	0.5	55.0
Unemployed	5,865	7.4	20.9	6.7	3.5	4.6	0.8	56.1
Not in labor force	69,920	5.3	17.3	6.2	3.9	5.1	0.7	61.5
Place of residence								
SMSA	147,419	6.5	19.2	6.6	4.0	4.7	0.6	58.3
Other	64,679	5.5	21.2	5.8	3.4	3.3	0.4	60.5
U.S. Census region								
Northeast	47,137	7.7	18.6	6.8	4.2	5.6	0.8	56.4
North Central	58,039	5.8	24.7	6.7	3.9	3.8	0.5	54.6
South	67,357	4.1	18.1	5.7	3.0	3.5	0.4	65.2
West	39,565	8.7	17.0	6.2	4.8	4.9	0.7	57.7

[a]Includes all other ethnic/racial groups not shown separately. [b]Includes persons with negative income. [c]Includes persons with unknown education. [d]Includes all those not in the labor force but less than 14 years of age. –The sample cell size was not large enough to estimate the population figure. Source: National Center for Health Services Research.

Table 4
Annual expenditures and sources of payment for dental services: Mean expense per person with expense and percent paid by source of payment
NMCES household data: United States, 1977

Population characteristics	Total population with expense for dental services (in thousands)	Mean expense per person with expense	Source of payment			
			Family	Private health insurance	Medicaid	Other[a]
		$	Percent distribution			
Total[b,c,d,e]	84,822	139	72.4	17.9	2.4	7.3
Age in years						
Less than 6	2,345	56	60.2	18.6	9.9	11.3
6 to 18	25,064	145	74.8	15.6	3.5	6.1
19 to 24	8,886	130	67.2	13.4	3.0	16.4
25 to 54	33,839	140	68.7	23.4	1.4	6.4
55 to 64	8,204	154	73.3	18.1	2.3	6.4
65 or older	6,485	141	88.7	3.8	*2.0	5.6
Sex						
Male	38,631	136	70.8	18.1	1.9	9.2
Female	46,192	142	73.6	17.8	2.9	5.7
Ethnic/racial background						
White	67,559	127	74.5	18.2	1.6	5.7
Black	4,438	114	53.4	29.3	9.8	7.5
Hispanic	2,556	146	63.7	16.1	11.4	8.7
Family income						
Less than $12,000	22,297	139	70.8	11.6	7.1	10.5
$12,000 to $19,999	22,660	123	71.5	20.1	1.5	6.9
$20,000 or more	39,564	149	73.4	20.3	0.3	5.8
Education of family head						
Less than 9 years	10,376	125	72.6	12.9	7.5	7.0
9 to 11 years	11,335	130	63.9	21.4	5.9	8.8
12 years	28,197	132	70.0	19.2	2.0	8.9
13 to 15 years	13,602	156	75.7	18.2	*0.6	5.5
16 or more years	18,921	153	77.8	16.5	0.0	5.6
Employment status						
Employed	39,163	142	70.4	21.2	0.9	7.6
Unemployed	2,525	144	66.4	20.2	3.5	9.9
Not in labor force	26,296	160	75.8	13.8	3.4	6.9
Place of residence						
SMSA	59,871	149	71.8	18.8	2.6	6.9
Other	24,951	116	74.2	15.2	2.0	8.6
U.S. Census region						
Northeast	20,103	167	73.2	19.1	2.3	5.4
North Central	25,716	119	70.2	21.2	2.6	6.0
South	22,807	114	81.4	10.5	1.8	6.3
West	16,196	172	65.3	19.8	3.0	12.0

[a]Includes Medicare, CHAMPUS, CHAMPVA, the Indian Health Service, the Veterans Administration, the military, and other federal, state, city or county payers, philanthropic institutions, and unknown sources of payment. [b]Includes all other ethnic/racial groups not shown separately. [c]Includes persons with negative income. [d]Includes persons with unknown education. [e]Includes all those not in the labor force but less than 14 years of age. 0.00 indicates quantity greater than 0.00 but less than 0.05. *Relative standard error is equal to or greater than 30 percent. Source: National Center for Health Services Research.

Sources and Limitations

The data in this report were obtained in the major survey component of the National Medical Care Expenditure Survey (NMCES). In five rounds of household interviews, information was elicited on the use of and expenditures for health services. The survey reference period was January 1 to December 31, 1977. For the interview instruments, see *NHCES Instruments and Procedures 1* (Bonham and Corder, 1981). Information supplied by the respondent was amended in each round through the household summary update process, which allowed the respondent to correct or add to the information provided in previous interviews. Trained interviewers then updated a computer-generated summary of both expenditures and sources of payment for health care previously reported by the respondent. In the fifth interview, respondents reviewed with the interviewer each reported event of health care shown in the household summary.

Imputation of missing data

For approximately 10 percent of all dental visits in the sample, data on charges remained missing or incomplete; data on sources of payment were missing for approximately 4 percent. With one exception noted below, these data were imputed using a method developed at the U.S. Bureau of the Census for their *Current Population Reports* series.

This procedure imputes data for individuals with complete information to individuals with missing data but similar characteristics. Variables with known values for all individuals in the survey (e.g., age, U.S. Census region) were used to form groups of donors with known data on dental care, charges, and sources of payment, and identical groups of recipients with missing data. Within such groups, data were randomly assigned from donors to recipients. The exception to this imputation procedure was Medicaid charges and amounts paid, because the Medicaid program often pays the provider less than the fee-for-service charge. In the present case, Medicaid dental fee schedules for 1977 were used to impute missing charges and Medicaid payments according to U.S. Census region and selected dental services.

Flat fees and visits without charge

Flat fees are single charges for a series of visits, here usually for orthodontia. For the approximately 32 percent of dental visits in the sample associated with a flat fee, separate visit charges were subsequently calculated by dividing the total flat fee charge by the number of associated events of dental care, adjusted for the number of visits that occurred outside 1977. Dental visits provided without charge, either because they were free from the provider or made to a prepaid group practice, are included in the estimates of dental use and out-of-pocket expenses (Tables 1 and 3) but omitted from the estimates on charges and expenditures in Tables 2 and 4. These amounted to approximately 4 percent of all dental visits in the sample.

Sources of payment

The share borne by each source of payment of the total charge per item of use or event of care is expressed as a proportion to emphasize that the unit of analysis is the average charge and not the respective percent of items or events paid by different sources of payment. It is calculated by dividing the amount paid by the total charge for each item or event and then averaging this value over all items or events. The share borne by different sources of payment of total annual expense per person with expense is expressed as a percent, and is calculated by summing all payments by a specific source for all items or events and dividing them by total expenditures. Also, averages given for the respective sources do not reflect actual patterns of payment. For example, Medicaid usually pays either all or none of a specific charge.

Where the sum of percents reported for several sources of payment exceeded 100 per visit, the amounts paid by the family out of pocket were reduced to make the sum of percents paid by all sources equal to 100 percent. If the sum of percents reported paid by all sources was less than 100 percent per visit, the remainder was assigned to the "other" source of payment category.

Population characteristics

Family income. Incomes as reported for each member of the family during round 5 were summed across income types and family members to yield measures of total annual gross family income. The results approximated data from the March 1977 *Current Population Survey* of the U.S. Census Bureau on total income per family and the percent distribution of persons and families by categories of family income.

Employment status. Employment status was based on round 5 household reports. Persons were defined as employed if they worked for pay for the week preceding the round 5 interview. Persons were defined as unemployed if they had not worked for pay during the week before the round 5 interview, were not full-time students, and were either laid off or looking for work. Persons not in the labor force included all civilians 14 years or older not classified as employed or unemployed by these definitions. The sample was categorized to match population data from the Bureau of Labor Statistics on the percent distribution of persons 16 years of age or older by employment status for December 1977.

Race/Ethnicity. Classification by racial/ethnic origin was developed from a series of questions asked in the round 5 interview.

Persons 17 years of age or older were asked if their racial background were best described as American Indian or Alaskan Native; Asian or Pacific Islander; black; white; or other. They also were asked if their main national origin or ancestry was among one of the following:

- Puerto Rican
- Cuban
- Mexican
- Mexicano
- Mexican-American
- Chicano
- Other Latin American
- Other Spanish

All persons who claimed main national origin or ancestry in one of these groups were classified as Hispanic, regardless of racial background. Other persons were then classified as white, black, or other depending on their reported racial background.

These classifications were extended to the under 17 population based on family relationship codes. Persons who dropped out of the survey prior to round 5 are coded as unknown.

Definition of Terms

Dental visit: Any visit to a dentist, dental surgeon, oral surgeon, orthodontist, other dental specialist, dental hygienist, dental technician, or any other person for dental care.

Annual expenditures: The sum of charges for dental visits during the period January 1, 1977 to December 31, 1977.

Out-of-pocket expense: The sum of annual expenditures paid by the family.

SMSA: Standard Metropolitan Statistical Area.

Sample design

The survey sample was designed to produce statistically unbiased national estimates that are representative of the civilian noninstitutionalized population of the United States. To this end, the study used the national multistage area samples of the Research Triangle Institute and the National Opinion Research Center. Sampling specifications required the selection of about 14,000 households. Data were obtained for about 91 percent of eligible households in the first interview and 82 percent by the fifth interview. Approximately 11 percent of all survey participants provided data for only some of the time in which they were eligible to respond. Information for these respondents was adjusted to account for this partial nonresponse (Cohen, 1981). For a detailed description of the survey sample and of sampling, estimation, and adjustment methods, including weighting for nonresponse and poststratification, see Cohen and Kalsbeek, 1981.

The estimates of the percent of the population using dental services and the mean number of dental visits will differ from the estimates in the Health Interview Survey (HIS) for 1977 (National Center for Health Statistics, 1978). In addition to sampling variability, this is due to differences between the methodology of the two surveys. HIS is a continuing survey with separate samples taken weekly; NMCES used a single sample interviewed five times over an eighteen-month period.

Reliability of estimates

Since the statistics presented in this report are based on a sample, they may differ somewhat from the figures that would have been obtained if a complete census had been taken. This potential difference between sample results and a complete count is the sampling error, which is measured by a statistic called the standard error of the estimate.

The chance that an estimate from the sample would differ from a complete census by less than one standard error is about 68 out of 100. The chance that the difference between the sample estimate and a complete census would be less than twice the standard error is about 95 out of 100.

Tests of statistical significance were used to determine whether differences between population estimates exist at specified levels of confidence or whether they simply occurred by chance. Differences were tested using Z-scores having asymptotic normal properties, based on the rounded figures at the 0.05 level of significance. Unless otherwise noted, only statistically significant differences between estimates are discussed in the text.

Estimated standard errors

Standard errors for the statistics presented in this paper were approximated, by interpolation where necessary, using a curve smoothing procedure developed at the National Center for Health Services Research (Cohen, 1979).

Relative standard errors.

Totals: Where the statistics of interest are total estimates (T) of the population, of dental visits, or of dental care expenditures, an estimate of the standard error, SE, can be obtained by multiplying the relative standard error, expressed as a percent, of the respective T, RSE(T), by T, and then dividing by 100. Thus,

$$SE(T) = \frac{T\,(RSE(T))}{100}$$

For estimated population totals, the approximate relative standard errors expressed as percent are as follows:

Table I

Estimated population totals (in thousands)	Relative standard error (%)
500	18.9
1,000	13.5
2,500	8.7
5,000	6.4
10,000	4.8
25,000	3.5
50,000	3.0
100,000	2.6
200,000	2.4

Example: An estimate of 87 million persons in the U.S. population with at least one dental visit (.412,098,000 = .411, Table I) has a relative standard error of between 2.6 and 3.0 percent (Table I) or, by interpolation, a relative standard error of about 2.7. The standard error of this estimate, then, is

$$SE(T) = \frac{87{,}000{,}000(2.7)}{100}$$

$$= 2{,}349{,}000.$$

For the estimated number of visits, the approximate relative standard errors expressed as percent are as follows:

Table II

Estimate of dental visits (in thousands)	Relative standard error (%)
500	23.3
1,000	16.7
2,500	10.9
5,000	8.1
10,000	6.3
25,000	4.8
50,000	4.2
100,000	3.9
250,000	3.7
500,000 or above	3.6

For the estimated dental expenditures, the approximate relative standard errors expressed as percent are as follows:

Table III

Estimate of expenditures (in thousands)	Relative standard error (%)
$25,000	27.1
50,000	19.7
100,000	14.7
250,000	10.6
500,000	8.8
1,000,000	7.8
2,500,000	7.1
5,000,000	6.8
10,000,000	6.7
25,000,000 or above	6.7

Ratios: When the statistic of interest is a ratio, Y, such as a rate, mean, or percent, both the relative standard error of the numerator, RSE(N), and the relative standard error of the denominator, RSE(D), must be considered. Thus Y = N/D, and the standard error of Y is:

$$SE(Y) = Y \frac{\sqrt{RSE(N)^2 + RSE(D)^2}}{100}$$

where

$$Y = \frac{\text{number of visits}}{\text{number of population}}$$

or

persons with visit

for the mean number of visits per population or person with visit;

$$Y = \frac{\text{sum total of charges}}{\text{number of visits with charge}}$$

for the mean charge per visit;

$$Y = \frac{\text{total expenditures}}{\text{persons with expense}}$$

for mean expense per person with expense;

$$Y = \frac{\text{total paid by source}}{\text{total expenditures}}$$

for the percent of expenses attributed to each source of payment.

Example: For the standard error of the mean expense for dental care per person with expense ($187; Table 4), the relative standard error of the numerator, SE(N), is 6.5 percent (84,822,000 persons with expense x $187 = $15.9 billion, Table III); and the relative standard error of the denominator is approximately 2.7 (Table I). Then the standard error is:

$$SE(\$187) = \$187 \frac{\sqrt{(6.5)^2 + (2.7)^2}}{100}$$

$$= \$13.16$$

Direct standard error estimates: When the statistic of interest is expressed as a person or event based measure, direct estimates of standard errors have been derived for ease of calculation. For the estimated percent of persons with or without at least one dental visit, approximate standard errors expressed as percent are shown in Table IV. For the estimated proportion of the visit charge paid by each source of payment, approximate standard errors expressed as a proportion are shown in Table V.

Rounding

Estimates as presented in the tables are rounded to the nearest tenth of a percent or proportion and to the nearest dollar.

Table IV

Persons in the base of the percent (in thousands)	Estimated percent						
	2 or 98	5 or 95	10 or 90	20 or 80	30 or 70	40 or 60	50
	Approximate standard error (in percent)						
1,000	1.9	2.9	4.0	5.3	6.1	6.5	6.6
2,500	1.2	1.8	2.5	3.4	3.8	4.1	4.2
5,000	0.8	1.3	1.8	2.4	2.7	2.9	3.0
10,000	0.6	0.9	1.3	1.7	1.9	2.1	2.1
25,000	0.4	0.6	0.8	1.1	1.2	1.3	1.3
50,000	0.3	0.4	0.6	0.8	0.9	0.9	0.9
100,000	0.2	0.3	0.4	0.5	0.6	0.7	0.7
200,000	0.1	0.2	0.3	0.4	0.4	0.5	0.5

Example: The estimate of 41.1 percent of the U.S. population with at least one dental visit in 1977 is based on a population total of 212,098,000 (Table 1). This estimate has a standard error of approximately 0.5 percent.

Table V

Number of visits in the base of the average proportion (in thousands)	Estimated proportion						
	.02 or .98	.05 or .95	.10 or .90	.20 or .80	.30 or .70	.40 or .60	.50
	Approximate standard error (in proportion)						
1,000	.022	.035	.046	.061	.070	.075	.077
2,500	.014	.021	.029	.039	.045	.048	.049
5,000	.009	.015	.021	.027	.031	.034	.034
10,000	.007	.011	.015	.019	.022	.024	.024
25,000	.004	.007	.009	.013	.014	.015	.015
50,000	.003	.005	.007	.009	.010	.011	.011
100,000	.002	.003	.005	.006	.007	.008	.008
250,000	.001	.002	.003	.004	.004	.005	.005
500,000	.001	.001	.002	.003	.003	.003	.003

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